

Klondyke Tailings

Water Quality Assurance Revolving Fund ([WQARF](#)) Site

Boundaries:

The [Klondyke Tailings WQARF Site](#) (Site) is located on the north bank of Aravaipa Creek, approximately 4.5 miles upstream of the [Aravaipa Canyon Wilderness Area](#) in Arizona. The boundaries of this Site are irregular. The Site is comprised of two piles of mine [tailings](#), the soil between and adjacent to these piles, and the area approximately 50 feet into the stream bed of Aravaipa Creek, directly adjacent to the tailings piles. The Site is bounded to the east and north by the Klondyke County Road.

Site Status Update:

ADEQ is currently evaluating soil removal options on the residential properties near the Site. Once the scope is determined, if any soil is removed from these properties, it will be consolidated with the downstream tailings pile, and the downstream pile will receive the same erosion protection and [clean soil cap](#) installation as the upstream pile.



Aravaipa Creek

ADEQ will complete the Draft [Remedial Investigation](#) (RI) Report.

Community Involvement Activities:

A [community advisory board](#) (CAB) has been formed for the Site. Details of meeting [agendas](#) and minutes for 2008 and 2009 can be viewed at the ADEQ Web site. These meetings are open to the public. ADEQ distributes fact sheets and public notices to the nearby community when significant events occur. Fact sheets are sent to residents in the community involvement area and distributed at the Site repository at the U.S. [Bureau of Land Management](#) (BLM) ranger station in Klondyke. The most recent [fact sheet](#) can be found on the ADEQ Web site.

Site History:

1870-1950: From the 1870s through the 1950s, lead, zinc, copper, silver, and gold mining was conducted in the Klondyke area of the Aravaipa Mining District. In 1948, the Athletic Mining Company constructed a flotation mill next to Aravaipa Creek that operated until about 1958 and generated, in part, the tailings at the Site. Other possible sources are being investigated.

1993: In March, a complaint concerning erosion and runoff from the tailings pile was filed with ADEQ, and an investigation began. The results of that investigation revealed high levels of lead and arsenic in the tailings piles and surrounding soils and acidic runoff emanating from the Site.

1997: In October, ADEQ received an [Arizona Water Protection Fund Grant](#) to conduct a preliminary investigation, compile existing data, and evaluate possible remedial alternatives at the Site. The [U.S. Fish and Wildlife Service](#) conducted fish tissue sampling and analysis of fish in Aravaipa Creek at two sites within [Nature Conservancy](#) property. The results of that investigation revealed elevated levels of [arsenic](#), [cadmium](#) and [lead](#) in fish tissue, though not at levels that threatened native fish species.

1998: In September, the Site was placed on [WQARF Registry](#) with an eligibility and evaluation score of 69 out of a possible 120.

1999: ADEQ contracted with URS Corp. to conduct the RI for the Site.

2001: In July, fifteen private wells in the Klondyke area were sampled. No drinking water standards were exceeded in any of the wells tested. Results indicated very good water quality. In December, samples of tailings were collected and analyzed to assess the long-term potential for generating and releasing acidity and metals from the tailings as a result of storm water runoff. The results of the Phase I investigation indicate high levels of stored acidity in the two tailings piles.

2001-2002: Magnetic and electromagnetic geophysical surveys were conducted to identify the possible presence of buried drums, tanks, and piping that may contain contaminants.

2002-2003: Aerial photography and topographic mapping were conducted to provide the technical background necessary to conduct a geomorphic and floodplain analysis of the Site. The 100-year and the 500-year flood plains were delineated. Soil sampling was conducted for bioavailability testing. The results of that testing indicate a wide range of bioavailability for lead-contaminated soils and tailings and a low level of bioavailability for arsenic in soils and tailings. Biological, archeological and cultural resource surveys were also completed.



Old Flotation Mill Buildings at Klondyke Tailings Site

2005-2006: ADEQ completed one [early response action](#) (ERA) at the Site. During the ERA, ADEQ excavated 11 geophysical targets previously identified during the geophysical survey. No buried tanks, drums or pipelines requiring removal were found. During the ERA, a small amount of laboratory reagents still present at the Site was also removed. Also during the ERA, ADEQ conducted minor earth moving repairs such as repairing berms around the tailings piles and correcting drainage problems to contain storm water runoff on the tailings piles.

ADEQ continued with the RI at the Site. The activities for the RI included soil sampling on the entire Site to determine the extent of soil contamination. Sampling results indicated that adjacent properties also needed to be evaluated. In 2006, over 1,700 soil samples were collected and analyzed using X-ray fluorescence. Samples were collected from the surface, a depth of six inches, a depth of one foot and a depth of two feet. The RI also included sediment sampling in Aravaipa and Laurel Creeks both upstream and downstream of the Site.

In addition, four groundwater [monitor wells](#) were installed at the Site and quarterly monitoring and analyses of groundwater samples from these wells indicates no impacts to the groundwater beneath the Site from metals above [Aquifer Water Quality Standards](#) (AWQS).

ADEQ also continued to evaluate ERA activities at the Site. A significant flood event occurred in Aravaipa and Laurel Creeks during late July and early August of 2006. In an ERA Analysis Report in 2004, URS proposed two ERA alternatives to begin to consolidate the tailings at the Site. The first recommendation was to relocate tailings out of 10, 25 and 50 year flood plains and place a clean soil cap over the tailings. The second recommended alternative was to relocate tailings out of 10, 25 and 50 year floodplains and construct a berm around the tailings to limit migration on tailings into Aravaipa Creek.

2007: For the RI, ADEQ continued collecting soil samples from properties adjacent to the tailings piles to determine the extent of contamination in the area. Approximately 500 additional soil samples were collected during 2007.

Groundwater sampling continued at the Site and analyses of groundwater samples from on-site wells indicate no impacts to the groundwater beneath the Site above AWQS. Private wells in the area continue to be sampled at the property owner's request.

ADEQ continued evaluating the proposed ERA alternatives. The August 2006 flooding altered the channels of Aravaipa and Laurel Creeks. Based on the flooding, ADEQ was concerned that consolidating the tailings or constructing [berms](#) in the floodplain may have adversely impacted adjoining properties. The proposed ERA remedies were re-evaluated considering the new conditions. URS sub-contracted with Fuller Hydrology to update the floodplain analysis and evaluate the impacts of the most recent flood assuming the proposed ERA remedy and possible alternative options were in place at the time of the flood. After reviewing the updated floodplain analysis, ADEQ and URS determined that moving the tailings out of the 100-year floodplain was not possible because very little of the property was outside the 100-year floodplain. ADEQ and URS also determined that threats exist to the upper tailings pile from flooding and lateral migration of Aravaipa Creek. Based on this decision, ADEQ moved forward with a plan to protect upper tailings piles in its current location. ADEQ also decided to move a small portion of the lower tailings pile, closest to Aravaipa Creek, to be consolidated with the upper tailings pile.

In August, URS provided ADEQ with an Erosion Protection Alternatives Analysis. The Erosion Protection Alternatives Analysis evaluated estimated construction costs and operation and maintenance costs for several methods of erosion protection of the upper pile. In October, ADEQ authorized URS to begin designing the erosion protection for the upper tailings pile using [gabion mattresses](#). In December URS and ADEQ met with the [U.S. Army Corps of Engineers](#) and determined as long as construction activities remained outside the normal high water mark of Aravaipa Creek, no permit from the U.S. Corps of Engineers would be required.

2008: Results of soil samples collected in late 2007 and provided to ADEQ in January 2008 indicated, with the exception of the contribution of contamination from the Laurel Creek watershed, that the extent of soil contamination above the residential [soil remediation level](#) of 400 milligrams per kilogram (mg/kg) for lead has been defined on all properties that allowed

ADEQ access to collect samples. One property owner, to the east of the Site, did not allow ADEQ access to collect soil samples.

In June, ADEQ and their contractors completed the consolidation, capping with a two-foot clean soil cover and installation of erosion protection on the upstream pile. During fiscal year 2008, ADEQ spent approximately \$3,000,000 on construction of the erosion protection and cap for the upstream tailings pile. ADEQ received a draft of the RI Report from the contractor.



Completed Erosion Protection and Clean Cap on Upstream Tailings Pile

Contaminants:

The current contaminants of concern at the Site include [lead](#), [cadmium](#), [antimony](#), [beryllium](#), [copper](#), [manganese](#), [arsenic](#), and [zinc](#). Physical evidence and testing of the groundwater and soil in the area indicate that runoff and leaching into Aravaipa Creek from the tailings piles may be occurring, and flooding of the creek could erode contaminated materials into the creek bed. Contaminants of concern at the Site may change as new data become available.

Public Health Impact:

The results of a [public health assessment](#) conducted by the [Arizona Department of Health Services](#) in 1999 suggest that the Site does not pose a health risk to nearby residents, campers, swimmers, ATV users or to those who consume fish from Aravaipa Creek.

Site Hydrogeology:

The Site lies adjacent to Aravaipa Creek in the Aravaipa Valley, a broad valley within the Basin and Range physiographic province characterized uplifted fault-block mountains and broad flat valleys. Groundwater is found in unconsolidated (young alluvium) and semi-consolidated (basin fill sediments) [alluvial](#) deposits within the valley. Most groundwater is withdrawn from the younger alluvium.

Wells in the younger alluvium range from about ten to 100 feet (or more) in depth. Wells can yield up to 1200 gallons per minute. Groundwater is shallow along Aravaipa Creek, ranging from about ten to 60 feet below land surface.

Aravaipa Creek is ephemeral for much of its reaches (upstream of the Site), has an intermittent reach starting at the Haby Spring (approximately 4.5 miles upstream of the Site), and is ephemeral at the Site and downstream of the Site for about three to four miles. Perennial flow begins near the Nature Conservancy Preserve, due to a thinning of the younger alluvium where faulting has uplifted semi-consolidated and consolidated basin fill deposits. Aravaipa Creek is perennial through the BLM wilderness area.

Contacts:

Name	Phone/Fax	E-mail
Scott Goodwin, ADEQ Project Manager	(602) 771-4452*/ (602) 771-4246 fax	sdg@azdeq.gov
Felicia Calderon, ADEQ Community Involvement Coordinator	(602) 771-4167*/ (602) 771-4138 fax	fmc@azdeq.gov

*In Arizona, but outside the Phoenix area, call toll-free at (800) 234-5677.

Information Repository:

Interested parties can review select Site documents at the [Safford City–Graham County Library](#), Reference Section, located at 808 Seventh Avenue in Safford, (928) 348-3202. During October through April, some files can also be viewed at the BLM Ranger Station in Klondyke, Arizona.

The complete official Site file can be reviewed at the ADEQ Main Office located at 1110 West Washington Street, Phoenix, Arizona. With 24-hour notice, an appointment to review related documentation is available Monday through Friday from 8:30 a.m. to 4:30 p.m. at the ADEQ Records Management Center, 1110 W. Washington Street in Phoenix. Please contact (602) 771-4380 or (800) 234-5677 to schedule an appointment to review these documents.